DOCUMENT RESUME

ED 313 730 CS 506 929

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TITLE The Modular Mind and Intrapersonal Communication Processes.
PUB DATE 20 Nov 89
NOTE 14p.; Paper presented at the Annual Meeting of the Speech Communication Association (75th, San Francisco, CA, November 18-21, 1989).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143) -- Viewpoints (120)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Cognitive Structures; *Communication (Thought Transfer); Communication Research; Discourse Analysis; Language Processing; *Models; Perceptual Development; Social Cognition; Synthesis
IDENTIFIERS Brain Functions; Communication Competencies; *Intrapersonal Communication

ABSTRACT

Based on a prior model on modularity of the brain, a new modular model of intrapersonal communication was developed which focuses on brain processing, encompassing both the structures and the functions of those structures in the creation of messages. The modular mind is a bio-social model of communication which presupposes a relationship between the function and structure such that one cannot be examined without the other. Communicative focus necessarily centers on the functions associated with brain modules, how they receive, process and communicate the stimuli (information) with which they work. The processing mechanisms and modular networks interact to produce hemispheric modular cooperation and dissonance, the brain's way of sorting information used to produce perceptions and messages. Several issues arising from holographic theory, dissipative structure, and chaos theory may produce new directions for both theory and research in intrapersonal communication. (Forty-six references are attached.) (KEH)

THE MODULAR MIND AND INTRAPERSONAL COMMUNICATION PROCESSES*

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*A paper presented to the Intrapersonal Processes Commission, Speech Communication Association. November 20, 1989.

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Abstract

The role of the brain, both in processing and interpretation of information, is examined as a function of mind. Advanced is an argument for the MODULAR MIND and its impact on understanding and predicting communication. Issues and directions for neurophysiological/bio-social research are examined.

The purpose of this paper is to examine an approach to intrapersonal communication that focuses on the communication processing structures of the brain which leads to the function we normally label, "communication." Since the middle 1970s I have been interested in the general question of how the brain processes and interprets messages. Further, I have been interested in how that processing affects normal -- as well as "abnormal" -- communicative situations. This led me to posit a "preverbal" theory of intrapersonal communication (Stacks, 1981, 1983). Later theoretical work with Peter Andersen (1987, 1989), Mark Hickson (1985, 1989, in press), and Daniel Sellers (1986, 1989, in press) refocused this approach to brain processing, a focus away from a dominant function for specific brain structures to the stylistic functions associated with the brain or the current modular functioning approach discussed here.

THE MODULAR MODEL

The concept of modularity in general is not new (cf., Fodor, 1983) and it is not the purpose of this paper to review it great detail. Instead a general review of the modular mind sets the stage for the future study of this approach to intrapersonal communication. Gazzaniga, as early as 1978 (Gazzaniga & LeDoux, 1978; Gazzaniga, 1985), suggested that the human brain operates on a modular basis -- like a federation of governments, each module consisting of a state which has the independent abilities of cognition, feeling, memory, and action. Hence, as with any federation, one state or module can influence the actions of the other modules or the entire federation. The analogy to the brain is consistent with neurophysiological research which suggests that a number of distinct memory systems exist in each individual's mind (Witelson, 1987). These systems are functionally organized and each is independently capable of learning. Damage to one system may have little or no effect on memory.

In a similar theoretical perspective I posited a paralliel model which described how preverbal brain "centers" prepared the individual for communication (Stacks, 1983). Both Gazzaniga and I theorized that their components are (1) capable of independent action and cognitive activity; (2) that each is able to receive and process external, as well as internal, information; and (3) that each is capable of providing us with unified cognitions and behavior. Hence, it follows that modular functioning may be directly related to "feelings" as differing modules interpret internal and external stimuli.

The modular mind, however, is not simply a psychological concept, it exists within the various parts of the brain (Ojemann, 1986). The brain's modules have specific duties and functions, are specialized from birth for those functions (Andersen, Garrison, & Andersen, 1979; Witelson, 1987), and are arranged functionally in hierarchical groupings (Stacks, 1983). As Gazzaniga (1985) concluded, it is "clear that modularity has a real anatomical base" (p. 128).

The mind's modularity as it relates to the intrapersonal processes of communication becomes important as it influences the cognitive manifestations of

communication. As suggested, the preverbal stage, the preinterpersonal stage of communication, serves as a "loading" mechanism for an individual's verbal and nonverbal communication (Stacks, 1983; Stacks & Sellers, 1989). "This stage is generally unconscious, intrapersonal, and serves as a screening mechanism for subsequent behavior. This stage serves to establish the intrapersonal system, operating as a storage center for such concepts as attitudes, values, scripts, goals, plans and beliefs; concepts which make us human" (Stacks & Andersen, 1989, p. 279). As has been established by a number of researchers, the intrapersonal impact on subsequent communication is both predictable and important (cf., Barker, 1986; Borden & Stone, 1976; Cunningham, 1989; Goss, 1982).

Of importance to our study of communication, then, is the way in which the various brain modules receive, process, and communicate the stimuli (information) they work with. The next section examines the processing mechanisms and modular networks which interact to produce hemispheric modular cooperation and dissonance, the brain's way of sorting our information used to produce perceptions and messages.

Modular Processing

Perhaps the largest of the brain's modules are the two cerebral hemispheres themselves. Each brain hemisphere can be conceived as an alliance of federations with a particular aim or function in mind. This metaphorical analysis clearly is close to the earlier held notion that each brain hemisphere was dominant for a particular function of communication (i.e., verbal or nonverbal functioning). However, it is clear that the modules located in the left hemisphere have a particular style of operation that may be characterized as more logical and verbal, while the right hemisphere's style is more affective and nonverbal (Stacks & Sellers, 1986, 1989). In reviewing the previous literature, it is clear that the right hemisphere's input is stylistically and functionally different than its left counterpart. These stylistic differences, then, underlie the nature of the processing itself.

Hemispheric Communication. At one level we can operationalize hemispheric communication as the communication of the "cerebral hemispheres. . .[as] central superprocessing modules" (Zaidel, 1985a, p. 135). Such communication is limited, however, by the anatomical boundaries of the brain and lack of interconnections, other than the corpus callosum, between them. As Zaidel (1985b) noted, the brain hemispheres "have sharp anatomic boundaries and some apparently sharp functional demarcation as well. The interaction between hemispheres thus becomes a paradigm case for information transfer within the cognitive-cerebral network" (pp. 54-55). The implication is clear: the modules located within each hemisphere work together in some loose federation under the guiding control of the "superprocessing" mechanism of that hemisphere. Further, it is conceivable that "backup" modules may exist within the other hemisphere which approximate the function of the other. As Zajonc (1984a; 1984b) has pointed out, affect (right superprocessing module) and cognition (left superprocessing module) are independent, separate and parallel systems which often function together. Support for this cognitive-affective dichotomy is offered by Swain et al. (1987) who propose that the cognitive system is designed for classification and assessment while the affective system is designed to provide rapid responses to the individual's safety.

Other research suggests that this analytic-holistic difference may be a function of the detail (left hemisphere) and novelty (right hemisphere) of the information being processed (Sergent, 1983). Additionally, studies of language acquisition and the "neuromaturational" process indicated a left hemisphere predisposition for language

processing. As a child matures, however, the right hemisphere becomes more involved in language activities. Between ages five to 13 years of age such predisposition for language (cognition) begins to equalize (Keith, 1981; Williford, 1978). Sergent (1983) suggests that a child's predisposition to right hemispheric processing of less refined or larger stimuli (e.g., letters) when learning to read. These findings strongly suggest that both brain hemispheres analyze and process the same information; however, each hemisphere's function differs as to the interpretative processes it is best suited to conduct.

The type of communication employed by the brain's major modules has been studied for a number of years as interhemispheric communication, communication between brain hemispheres, cross-callosal interaction, and as cross-talk between left and right hemispheres (Andersen, Garrison, & Andersen, 1979; Bogen, 1985; Gazzaniga & LeDoux, 1978; TenHouten, 1985; Sperry, 1985). The transfer of information between the hemispheres, then, is an important function in the creation of the mind. Essentially one brain becomes a sender of a message which is transmitted through the corpus callosum (channel) to the other hemisphere (the receiver).

In the approach proposed herein it is this transmission of messages between hemispheres -- and within hemispheres -- that constitutes the intrapersonal processing of communication. Such communication is not "thinking," since modules and hemispheres can "think" and operate on information independently. The modular approach clearly implies that complete messages -- "thoughts" -- are communicated within and between modules, each impacting on the processing of each other and the final interpretation of the communication situation and the ultimate communicative behavior exhibited by the individual.

How do these modules operate in the process of "normal" communication? As of now we know that hemispheric communication occurs, but as Gardner (1983) argued, "communication between modules occurs, only subsequently in ways that remain obscure" (p. 132). Peter Andersen and I suggest that "In a metaphorical sense brain modules and hemispheres behave much like individual interpersonal interactions in everyday communication; they inhibit, struggle for control, compete, cooperate, facilitate, create paradoxes, coexist, and promote harmoniousness" (Stacks & Andersen, 1989, p. 281). As such, we can conceptualize "normal" communication as the healthy interpersonal relationships of modules within first the superprocessing module they exist and, second, between the two major modules themselves. This form of communication may be termed "modular cooperation" and "modular dissonance."

Modular Cooperation. From the modular approach, normal communication is a function of cooperation between the hemispheres. In the interpersonal analogy previously offered, this cooperation includes both harmonious and disharmonious conflict. To what extent is each hemisphere's cooperation necessary for the processing of normal communication? This will differ according to a number of factors, including the complexity of task, processing of certain types of information, creativity, and dialectical thinking (Stacks & Andersen, 1989).

How the brain receives and processes information has been detailed elsewhere (cf., Shedletsky, 1981, 1983; Segalowitz, 1985; Stacks & Sellers, 1989). A brief review of the processing mechanisms in relation to modular cooperation should help flesh out the role of information and task in hemispheric cooperation. Recent research has demonstrated that while the left hemisphere is primarily responsible for verbal communication, both brain hemispheres have the capacity for language and contribute to the final analysis of intent. How that analysis is carried out and with what effect, however, is a result of the particular hemisphere's function and style.

In most daily communication the left hemisphere's ability to logically interpret events and information makes it truly "dominant" for most processing tasks. In this manner the modules contained in the left hemisphere federation exert more influence and ultimately control the situation. This occurs, however, only when the interpretation of the situation fits with the logical processes associated with current cultural mores, rules, and laws. The function of the right hemisphere federation is more affective in nature and serves to guide the left in situations where the "norm" has been deviated from (Hickson & Stacks, 1989; Zaidel, 1985b) and in situations where anxiety may be present.

A large body of clinical research demonstrates the integrative function of hemispheric cooperation. Research on split-brain patients, for example, suggests that when the left hemisphere must interpret messages without right hemispheric input due to a severing of the corpus callosum, that message is interpreted literally. As such, sarcasm, emotion, and humor are lost to the processor of the message. Moscovitch (1983) has suggested that high imagery or highly affective tasks require processing through the right hemisphere, which then functions as a "priming mechanism" for the left's logical interpretation of the affective mood or intent of the message. This priming is a major function of normal intrapersonal communication. Safer and Leventhal (1977) support this interpretation in "normal" people. They found that use of both hemispheres produced more accurate ratings of message content and the tone of voice used to present messages. However, subjects who processed messages via the left ear (right hemisphere processing) primarily used tone of voice to rate messages, whereas right ear (left hemispheric processing) subjects primarily used message content to rate messages.

Behavioral research has demonstrated that, in normal situations, the left hemisphere can and does operate basically alone. Dan Sellers and I (Stacks & Sellers, 1986) presented messages of varying intensity to either one hemisphere or the other and noticed no apparent behavioral changes for messages characterized by low to moderate language intensity. However, when exposed to highly intense messages, the left hemisphere only subjects perceived the message as more positive and persuasive and the source more credible than their right hemisphere counterparts. They explained these findings in part due to a lack of the right hemisphere's "priming" function. That is, without the priming function in operation during message processing the left hemisphere had to make interpretations based on the literal meaning of the message, interpretations were then sent to the right. Hence, they suggest that when communication situations are outside the accepted norms associated (such as inappropriately high language intensity) with a communication (and these may change as the individual becomes assimilated to a particular environment), increased right hemisphere processing is necessary, especially "priming" the left for non-normative information. This right hemispheric function is carried out through transfer of information through the corpus callosum (cf., Shedletsky, 1981, 1983).

Other research has demonstrated that hemispheric cooperation is necessary for tasks requiring creativity or dialectic types of thinking. TenHouton (1985) found that split brain patients showed a lack of creativity, that is, they failed to verbally express fantasies, symbols, insights or feelings. Obviously, the processing of both hemispheres is superior to that of one. Many times, however, it is more parsimonious for the "dominant" hemisphere to process and interpret information leading to communication. This is possible during "normal" communicative situations -- where societal rules are followed. However, there are times when for a variety of reasons "normal" communication is not possible. The next section details both "normal" disharmony and pathological disharmony and its effects on communication.

Modular Dissonance. At times the harmonious interchange of information between modules and hemispheres becomes disrupted. This, we suggest, develops along the line of Festinger's (1957) theory of cognitive dissonance, one of the more developed models of consistency and change (Stacks & Andersen, 1989). When modules "collide" regarding a belief, attitude, or processing nuance two things may happen. First, change occurs. The reasons for such conflict are worked through, stored in the effected modules memory and the mind moves to another state. Second, however, would be chaotic, unorganized, and fragmented behavior. We believe that the experience of dissonance and its reduction are beneficial to the mind. If "there was no means for resolution or dissonance reduction, mental confusion and disarray would predominate. The human brain may be constructed for this process to prevail" (p. 285-286). Gazzaniga (1985) further proposes that dissonance allows for the constant testing and retesting of beliefs, yielding an array of modules harmoniously testing new situations, retesting old situations, and possibly pretesting situations into the future.

Modular dissonance, then, can be perceived as a function of normal hemispheric processing. It occurs when either internal or external stimuli produce changes in processing such that memories or predisposed processing mechanisms come into conflict. Such conflict -- and its resolution -- is good, promotes growth in the individual through a constant reevaluation of beliefs and attitudes, and serves to test the "normalcy" of the current situation. There are times, however, when this modular dissonance gets out of control. That is, one module temporarily interferes with normal processing and inhibits the other module. At the hemispheric level this modular inhibition may produce confusion and anxious behavior. These minor inhibitions may explain how logical-affective discrepancies are resolved through intrapersonal communication. Along this same line, Swain et al. (1987) posited that people are often caught in a "cognitive-affective crossfire" whereby the cognitive system infringes on the affective system over time. This interference yields a change in the affective "coloring" of the situation, making it more normal than it had previously been (cf., Sarason & Sarason, 1986). We suggest that this may be part of the basis of cognitive therapy "which encourages patients to reinterpret negative events" (Stacks & Andersen, 1989, p. 286). As with many affective interpretations, the conscious (left) module may actively suppress the information to the less conscious right hemisphere, thus ensuring that any distress, grief, or agony do not overcome the conscious awareness of the situation.

Summary

The modular mind represents a model of brain processing encompassing both the structures and the functions of those structures in the creation of messages. It presupposes a relationship between function and structure such that one cannot be examined without the other. Hence, the modular mind is a bio-social model of communication. Our communicative focus necessarily centers on the functions associated with modules; an area of concern, however, is with potential disruptors of the structure -- either in terms of actual modular function disintegration or modular network disruption. The next section focuses on several issues important to the study of intrapersonal communication from this perspective; it also suggests that holographic theory, dissipative structure, and chaos theory may produce new directions for both theory and research in intrapersonal communication.

ISSUES AND DIRECTIONS IN INTRAPERSONAL COMMUNICATION: MODULAR PROCESSING

The preceding discussion of the modular model and its implications for the study of human communication confronts several issues that have been faced by past intrapersonal researchers. Many of those issues were addressed by the participants of the 1988 New Orleans debate. It seems clear, however, that the issues concerning neurophysiological research and theory can be identified in three areas: understanding theory, measurement, and analysis of intrapersonal communication processes. In this regard, the modular model, or any processing model of the brain associated with the mind, is open to criticism addressed to any bio-social approach to communication (see Stacks, Hill, & Hickson, in press). The issue here reflects I suppose a concern with reductionism. However, I perceive no problem with reductionism if the focus of the theory and research is an understanding of how and why the individual communicates with (a) self and (b) others.

Issues of Understanding

Tied to the issue of understanding is a concern with the unit(s) of analysis studied by the intrapersonal researcher. To me, this concern is reflected more in understanding how the mind operates and less on methodological issues. My concern is focused on how the mind operates -- how the brain processes the information. An important consideration here is the focus on chaos as an explanatory principle. I am more convinced now that ever that the mind's modules operate on a chaos principle, much as advocated by Ilya Prigonine (Prigogine & Stengers, 1984) and James Gleick (1987).

Why chaos? Four reasons suggest to me that chaos theory may play an important explanatory role in understanding modular communication. First, chaos theory and bio-social theory are interrelated. They both seek answers to questions of natural systems, of which the human is one. Second, chaos theory provides an explanation for very complex behavior via a simple (but revolutionary) organizational pattern. Third, chaos theory helps to further understand modular cooperation and dissonance, providing further evidence that modular dissonance is a required condition to mind. And, finally, chaos theory helps explain some of the research findings associated with mind and communication.

A chaos interpretation of the brain's information processing suggests that a function of hemispheric processing is to manage the amounts of information it receives. That is, the brain is predisposed to make order out of disorder. Consider, for instance, that the human mind can create a past, a present and a future from information gathered from any of those time frames. Consider, too, that while processing such information, additional external information is being processed. Some of this information is consistent and some is inconsistent with the "internal" information. Chaos reigns, yet order prevails. It appears that normal intrapersonal communication processing requires the stimulation that chaos provides. An interesting finding, one that really shouldn't surprise us, is that the idling brain (the brain without disorder) yields a brain that loses awareness (Taubes, 1989). A study reported by Paul Rapp (1989) on epileptics found that petit mal seizures produce less rather than more brain wave activity; the brain becomes more ordered during the attack than chaotic. As noted in our model, modular dissonance helps control the natural chaos, moving the mind from one level to another. Hence, the process of dissonance produces normal functioning.

Chaos theory also suggests two important processing functions. The first concerns change and may help us understand how the "normal" mind. Simply put, chaos theory predicts that the greater the number of variables active in the system, the more the order.

That is, as the brain -- through its various modules -- processes chaos, the more ordered it becomes. On the other hand, a few key variables can produce extreme chaos and abnormal communicative behavior. This fits well with Dan Sellers and my explanation of communication competence and avoidance (Sellers & Stacks, in press). We suggest that modules important to a communicative situation may weigh more heavily on interpretation of that situation, producing communication apprehension.[1] Most of us realize that some apprehension is necessary to produce competent messages; however, there are times when all of us are apprehensive about communicating. This apprehension can be caused by internal or by external stimuli. In most cases we can reason through the dissonance caused by the situation ("I am giving a speech to my colleagues and I'm scared;" "I talk to students each day about this, there is little difference," etc.) and produce normal competent communications. However, self-concept may be low, a bad experience in the last presentation may be remembered, or someone is in the audience who is important may in itself produce abnormal behavior. Attempting to add variables to the equation (arguments as to why we shouldn't be apprehensive) should increase modular dissonance and produce less apprehension.[2]

Second, chaos theory argues that complex systems are best explained by simple organization. If intrapersonal communication were truly reductionist we would be interested in the networking of individual neurons and synapses as they pass information from cell to cell, building to the level of hemisphere module. In fact, we are not. We are interested in how the modules process information, exchange information, and yield conclusions that may or may not be verbalized. Further, as Prigogine argues, and Edward T Hall (1984) suggests, it may be that the simplest interpersonal reason for communication is an ability for two people to synchronize their brain waves, thus producing understanding.[3]

Based on this logic we might re-examine our earlier findings of the persuasibility of the left hemisphere (when it receives information in isolation from the right hemisphere module). In normal persuasive situations the two hemispheres work together, each producing information that is ultimately processed by the left supermodule's analytical style. That processing is chaotic -- high language intensity should produce dissonance between modules; the right module focusing on the emotive impact of the word or metaphor and this interpretation causing dissonance when related to the left hemisphere module's interpretations. Dissonance reduction yields an interpretation by the left hemisphere that the message is out of the normal "range" of accepted behavior and it is rejected. However, if normal reception is interrupted and one key module (the right hemispheric module that interprets emotion, for instance) produces hemispheric cooperation rather than dissonance the message may be accepted as novel and persuasive. However, if the message was composed of numerous highly-charged arguments, it follows, that, in such a case, the over use of intensity would produce order rather than disorder, no change rather than change.

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[1]We also suggest that pathological abnormalities within key modules may produce trait-like apprehension. For the purposes here, this is not considered, but could be considered a "strange attractor" in chaos terminology. For more on this see: Ferguson (1980), Prigogine and Stengers (1984), and Taubes (1989).

[2]Stacks and Stone (1984) report findings supportive of this interpretation.

[3]It is way beyond the scope of this paper to examine this phenomenon. For more information see: Hickson & Stacks (1989), pp. 180-183, 217-219.

Issues of Methodology and Analysis

Methodological and analytical issues concern me less than theoretical ones. Why? First, I am as comfortable with working with the physiological as I am the behavioral. I believe that objections to either method can be equally argued. However, I firmly believe that we must triangulate physiological, behavioral and the qualitative methods to really understand how the brain processes information. Brain waves, heat indices, and NMR or PET plots provide data that something is happening when a message is presented, when a communicator is preparing to present a message, or even when that communicator is meditating. However, what that internal behavior represents requires amplification from personal and external behavioral measures. For instance, suppressed right hemispheric alpha EEG readings recorded while a person hears a highly intense message is indicative of right modular functioning; if that person also indicates agreement with the message or argument via a pencil and paper measure, then we have some idea that the two (suppressed alpha and persuasion) are related. However, we might also ask the person what they were thinking while listening to the message (risking, of course, the fact they may not know what they were thinking -- or could not reflect back on the process of making a decision about the argument).

More complex are questions of analysis. This is so because the brain is not a linear decision maker. Traditional, linear, analytical models may not reflect modular processing. It makes more sense to examine the impact of modular processing nonlinearly. That is, from an exponential perspective; certain modules are more important than are others, but are important at different times. This also suggests that systems analysis may yield more profitable results than rule- or law-governed analyses. As an experimentalist, however, I still see a need for all types of analysis, from simple linear to the more complex nonlinear models.

Sooner or later intrapersonal modular research will examine the neural networks associated with modular processing. At that time variables such as memory may begin to play a larger role in communication processing than they currently do; perhaps along the lines of Pribram's (1971) "holographic theory" and the search for the elusive engram. It is my guess that memory and synchronicity will be highly related with modular functioning, accessed via the speed of neural transmission (as measured by wave length).

Obstacles

I am hesitant to deal with obstacles in this research paradigm for fear of sounding like "sour grapes." However, I believe that several obstacles must be overcome for neurophysiological/bio-socal research to accomplish its goals. Some of these obstacles were discussed in last year's debate. What are the most important? First, there are the discipline-related, turf-protectionist, arguments against the study of intrapersonal communication. We need to be more open to intradisciplinary research, to create research teams that include the behaviorist and the rhetorician. For example, I am interested in a post hoc analysis of speech-making based on such things as formal training, handedness and other variables. Consider, for instance, Jimmy Carter's speech making (as an engineer his orientation would be left modular) compared to Ronald Regan's (as an actor his orientation might be more right modular) or Jerry Ford (handedness). Such research teams would make use of the best we have. Second, we need more interdisciplinary research, we need to open up and work with professionals in other fields. In the neurophysiological area we need to be reading (and be read by) audiologists, physicists, psychotherapists, sociologists, and anthropologists to name a few areas of related interest.

Third, we must open our minds to ideas from other societies. What do we really know about thought other-than-Western? What could we learn?

A second concern is relates to method and is focused on the equipment necessary to measure internal states. We need to understand how biofeedback and other devices work, the type of data gathered from such machines, their limitations and where they should be employed. We need to be proficient in their use. In this regard, my work with Dan Sellers -- and my graduate study with Don Richardson at Auburn University -- helped me understand how biofeedback could help me answer my research questions. Obviously, however, we must be concerned with learning how to operate the machines at our disposal, to use different types of analysis for different types of data, and to focus our answers back to our communication questions.

SUMMARY

This paper has attempted to explicate a model of intrapersonal communication. It laid out the basic model and then examined several issues deemed important to this researcher. In all honesty I can make no claim to knowing where this will end -- or even where it will go. The mind is a constantly changing phenomenon; my mind certainly has gone through mood swings, confusion, dissonance, memory lapses, and even blanked while writing this paper. It is different now than it was before, yet I am still "predictable." Hopefully, research from this model will be disseminated in our journals and tests of the ideas presented herein opened to discussion. In the end, understanding how the mind operates, within the biostructure of the brain, should provide us with a better understanding of the human condition. It may be a chaotic trip, one fraught with the fears of the past presaged on the hopes of the future, but one surely worth taking.

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